treated rather cursorily. In speaking of the *man-engine* for raising and lowering men, Mr. Hunt points out that the reason why this valuable invention is so little used is "the unfortunate system under which the mines of Cornwall and Devon are worked—a system which does not encourage the holder of shares to take any interest in the mines themselves, his interest being confined to the market value of the shares which he holds." This remark is unhappily applicable to other districts.

In Chapter IV., on ore-dressing, after an historical sketch, the principles of the mechanical preparation of ores for the smelter and the various kinds of machines now in use are described with the aid of numerous illustrations.

Chapter V., upon the discovery and extraction of iron ores from veins and other deposits, is disappointing, on account of its meagreness compared with the space devoted to less important metals, and the Cleveland ore should scarcely have been dismissed in a dozen lines.

Book IV. relates to the future prospects of British mining. To persons interested in mines, whether as owners, shareholders, workmen, or merchants furnishing them with supplies, this book will no doubt seem the most important in the volume. Mr. Hunt is not sanguine about better prices for tin, and he says that "it is improbable that our native copper mines can be expected to prove profitable for some time to come"; in the case of lead he evidently is not more hopeful, and though the prospects as regards zinc are brighter, still we are unable to supply our own wants. In spite of the productiveness of our iron mines, we have to import more than three million tons of iron ore annually.

The fourth chapter of this book contains numerous useful suggestions for working mines, and is well worthy of consideration by miners and shareholders in mines. With reference to profitable mining, Mr. Hunt says (p. 868):—"The question is frequently asked, Is British mining a remunerative pursuit? Various replies might doubtless be given in accordance with any particular set of views and opinions held on the subject, but mines promoted by mere speculation can scarcely be expected to become profitable, inasmuch as they are too frequently grounded upon a misrepresentation of facts, while the capital connected with them is often largely diverted to the pockets of individuals whose main purpose is immediate gain. Further, the management or conduct of affairs is often leavened with ignorance and incompetency; the acquisition of personal gain, at the cost of unsuspecting shareholders, being unfortunately sometimes the rule of action." No one who knows anything about mining can fail to indorse these remarks.

In Chapter V., which contains the general summary and conclusion, Mr. Hunt says that "the exhaustion of our mineral wealth is now going onward at a rapidly increasing rate," and the question arises whether we can meet the demands of trade from British mines or not. According to the author, our tin ore is practically inexhaustible, but for copper, lead, zinc, and silver we must depend greatly upon foreign and colonial mines; of iron ore we have enough for some years, though certain foreign ores are of importance to us.

The situation is summed up as follows:—"Without great improvements in the principles of mining it will not be possible to work, at a profit, many of our deeper and more extensive mines."

The last two pages of the work, before the appendix, contain several important maxims which deserve the careful study of all persons engaged in mines, such as the necessity of supplying pure air *at any cost*, of raising and lowering the men by machinery, and providing for them in the event of accident or disease. The concluding words very properly strike at the rascality which has done much to wreck British metal mining. "Beyond these, to enable the adventurers in our Home Mines to compete satisfactorily in the metal markets with the proprietors of colonial and foreign mines, and to realise a profit on the sale of their minerals, it is absolutely necessary to study the strictest economy, and to establish—beyond the risk of any failure—the highest principles of honesty in every department, directly or indirectly, connected with British Mining."

The size of Mr. Hunt's volume is apt to alarm the reader, and the publishers would probably have done better by issuing the work in separate books. It strikes us, too, that undue prominence is given to tin, to the detriment of the more important metal iron. From the "Mineral Statistics" for 1883, we see that the iron ore raised had a value of about $5\frac{1}{4}$ millions sterling, whereas the value of all the other metalliferous ores put together was only $1\frac{1}{2}$ million. However, in spite of this favour shown to tin and of occasional inaccuracies, Mr. Hunt's *magnum opus* is very praiseworthy, as it contains a vast store of useful information, and the antiquary, the miner, and the capitalist are greatly indebted to him for having taken the trouble to chronicle so many valuable facts relating to such an important branch of British industry as Metal Mining.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

The International Geological Congress

WILL you allow me to announce in your columns that, in consequence of the outbreak of cholera in the South of Europe, the International Geological Congress is postponed to September 1885. JOHN MCKENNY HUGHES

Woodwardian Museum, Cambridge, August 12

The Volcanic Dust Phenomena

I WOULD draw the attention of such of your readers as may be travelling in Switzerland or other mountainous countries to the circumstance that in the clear atmosphere of the mountains the great corona or circle round the sun, as well as the semicircle seen opposite the sun before and after sunset continue to be markedly conspicuous; and the higher one ascends the more striking these phenomena are. I saw both the phenomena especially remarkable on the Gornergrat, altitude 10,289 feet, on the 21st and 22nd of last month; and even as low as 4000 feet they are decidedly more striking than at sea-level. It appears, therefore, that the bulk of the volcanic dust, if such it be, that still remains continues at a great elevation, and the prediction made last autumn that it might remain for years in the atmosphere, seems likely to be fulfilled.

The explanation of the strange sunsets given by "F. A. R. R." in NATURE (p. 155), seems a good one, except as regards the green appearance of the moon and stars; I must confess I am

not convinced that this was anything but a subjective phenomenon. It is true I saw it myself when there was little if any redness perceptible in the sky; but the probability is that one's eyes had become so dazzled by, and used to, the intense redness previously existing, that one was rendered incapable of seeing a moderate degree of red, and the complementary colour was produced in uncoloured objects. Besides, gas-lights sometimes partook of this colour. As regards the sun, I agree with "F. A. R. R." in the impression that when it was moderately near the horizon it was whiter than usual all last winter and spring, and perhaps to the present time.

Sunderland, August 6 T. W. BACKHOUSE

Upon the Occurrence of Bacteria and Minute Algæ on the Surface of Paper Money

THE recent researches of Paul Reinsch of Erlangen have shown the occurrence of different schizomycetes and of two new minute algæ (*Chroococcus monetarum*, *Pleurococcus monetarum*, Paul Reinsch) on the surfaces of the coins of many nations, living in the thin incrustations of organic detritus (composed especially of starch grains, fibres, &c.) deposited upon their surfaces in the course of long circulation. This extremely thin incrustation renders the coins very suitable for this micro-vegetation, but the same phenomenon is also exhibited in the case of paper money, and indeed by notes of clean and, to the unassisted vision of a quite unaltered appearance.

Having scraped off some of these minute incrustations with a scalpel and needle and divided them into fragments in recently boiled distilled water, with lenses of high powers (1/10th inch of Messrs. Beck) there were distinctly seen various schizomycetes, &c.

I have investigated the Hungarian recent and older (from the year 1848-49) bank and State notes, also Russian 1-rouble notes, and have found upon all of them– even upon the cleanest —schizomycetes, &c.

On the surface of all the paper money is always to be found the bacterium of putrefaction (*Bacterium termo*, Dujardin).

In the thin incrustations of paper-money the occurrence of starch grains, especially that of wheat-starch, linen, and cotton fibres, animal hairs, &c., are easily to be demonstrated, and upon the 1-forint[1] State-notes in such deposits the common saccharomyces are also to be found. Various micrococci, leptotriches (many with club-shaped swelled-up ends), and bacilli are also very frequent plants in these deposits on paper-money.

The two new species of algæ described by Paul Reinsch are very rare on the paper-money. The green pleurococcus cells I have observed in some cases on 1- and 5-forint State-notes and the bluish-green minute chroococcus on the edges of the 5-forint State notes.

The vegetation of the paper-money is, as a result of my researches, composed of the following minute plants:—

1. *Micrococcus* (various forms).
2. *Bacterium termo*.
3. *Bacillus* (various forms).
4. *Leptothrix* (various forms).
5. *Saccharomyces cerevisiæ*.
6. *Chroococcus monetarum*.
7. *Pleurococcus monetarum*.

From a hygienic point of view, also, the investigations of the commonest necessary household objects may not be superfluous, and I would especially call attention to these forms as occurring on the means of instruction, viz. the handbooks, &c., used by our young scholars.

JULES SCHAARSCHMIDT,
Privat docent of Cryptogamic Botany and Anatomy of Plants, Assistant at the Botanic Institute and Gardens, Royal Hungarian University, Kolosvár

Fireballs

THE following account I have received from a lady at Brühl near Cologne, July 26:—"8.22. A large fireball of scarlet fire almost as large as a harvest moon just sailed along and upwards, at a varying but mostly very rapid rate, until, at a great height, it remained for some minutes almost or quite stationary; then after some uncertain movements rose again, and rising, became smaller, until it finally disappeared. . . . Every one who saw it seemed petrified with amazement." This is of interest from the long time that the ball was visible, and its being seen by several people. I described some time ago some fireballs which I saw slowly moving at a distance during a storm in Egypt, which were then put down as illusory results of a flash (NATURE, vol. xxiv. p. 284), but now many similar cases have been lately reported. A large fireball, described as about a foot in diameter, was seen a few years ago near here; it struck a pavement, went over a low wall, moved across a wide lawn, and finally vanished in a wet ditch.

While living lately at San (Tanis), thirty-two miles south-west of Port Said, there occurred a most remarkable thunderstorm on May 12, lasting from 1.15 till 4 p.m. The rainfall in two hours was over 1½ inches; the hailstones (which covered half the area of the ground) were mostly 3/10ths to 4/10ths inch in diameter, and some 7/10ths, of concentric structure with jagged edges. Whenever I could hear anything above the battering of the hail on my iron roof there was always thunder going on; and as soon as the rain ceased I went out of doors, where for half an hour longer I can positively assert that there was not an instant of silence. This thunder was not in loud, reverberating peals, but was a continuous rushing, gusty, swishing sound; the noise rising and falling just like a gusty, tearing, high wind, without any crashes or explosive bursts, and with very little bumping or knocking sounds. It only lightened once or twice during that half hour, and there was but a faint breeze of wind. To the best of my belief the thunder was similar during the whole time of the storm, though with more explosive sounds and more lightning in the early part. It is impossible to refer such a storm to the ordinary instantaneous, sharp discharges with echoes, as the sound had no character of a reverberation; it appears to be due to a continuous discharge like that from a point. The storm was quite local, only extending a few miles. Since returning to England I have also heard thunder which was apparently not from an instantaneous discharge, as it began lightly and waxed louder for two or three seconds, until a loud crash of the main discharge took place.

The whole question of slow or peculiar discharges and of fireballs needs clearing up by careful observation; it is useless to ignore it or refer it to illusion, merely because we have not imitated it artificially or made a theory on the subject.

Bromley, Kent W. M. FLINDERS PETRIE

Museums

IN an excellent article on "Practical Taxidermy" in NATURE of August 7, reference is made to the Museum at Leicester as approaching to the ideal of what museums should be. While fully agreeing with the opinions attributed in that article to Mr. Bowdler Sharpe, and admitting that the Leicester Museum has at last taken one step towards the ideal which was worked out for it some years ago, I feel bound to point out to such other museums as are waking up to the necessity of a radical revolution, that perfection is a long way off yet; that there is ample room for each to do better than its predecessor; that Leicester has not even carried out the general principles laid down by Mr. Bowdler Sharpe; and that these general principles may be developed in various directions.

They should consider what a provincial museum can do to the best advantage, for the world, for local students, and for the unlearned public; and by what methods of arrangement, of public exhibition and of private access, its highest functions can be most completely brought out.

Of the three educational objects for which rates can be levied by Town Councils, viz. museums, free libraries, and art galleries, the popular taste is rather tending just now towards the free libraries and the art galleries. There is a disposition to regard museums as mere hobbies for the few, and to devote the lion's share of the rate to literature and art. This is perhaps only a swing of the pendulum, but it is justified to a large extent by the condition of nearly every provincial museum at the present time.

Science is taught in most museums as reading, writing, and arithmetic were taught in the old-dame schools—in a clumsy, thoughtless, perfunctory manner, which wasted half the time and interested nobody. Mr. Mundella, with the Education Act in his hands, has made a revolution in the schools; if Mr. Bowdler Sharpe will get his ideas developed in museums with equal success, he will supplement the schools in a most valuable and important direction.

[1] 1-forint (to German Gulden) = 2*s*.